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(54) Wireless network for controlling various household units

(57) Disclosed herein is a local area network for the control of household units, such as appliances and consumer electronics. Each appliance is provided with a transceiver and an interface unit for configuring its household unit in response to command from a network manager. Communications between the network manager and interface units are performed over RF links.

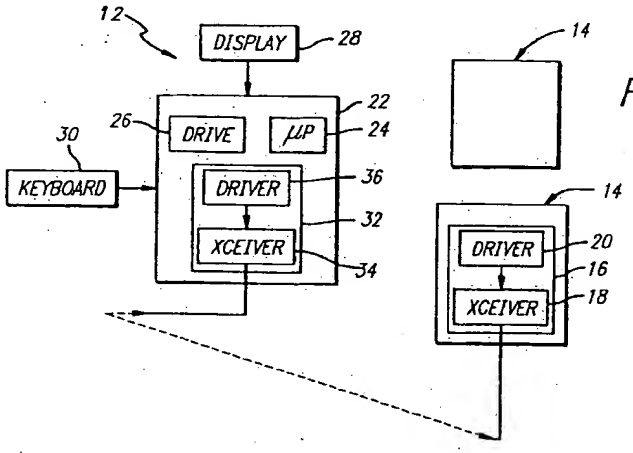

FIG. 1

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Description

BACKGROUND OF THE INVENTION

The invention relates in general to wireless communication systems and in particular to wireless local area networks. The concept of networking is evolving from wired networks to wireless networks. In a wired network, a signal flows from one device to another across a physical medium such as a copper wire or a fiber optic. In a wireless network, a signal flows over the airwaves at a radio frequency. The wireless network eliminates two unbecoming aspects of wired networks: the unsightliness of cables, and the expense of cable installation. The wireless network also allows devices in a wireless network to be untethered and moved about freely.

SUMMARY OF THE INVENTION

The present invention takes advantage of the untethered devices and adapts a wireless network to control a plurality of household units. The network comprises a plurality of interface units corresponding to the plurality of household units, each interface unit being electrically interfaced to a corresponding household unit; and a plurality of first RF transceivers corresponding to the plurality of interface units, each RF transceiver being in electrical communication with a corresponding interface unit. The network further comprises a second RF transceiver operable to communicate with the plurality of first RF transceivers; and a processor programmed to generate commands for controlling and checking the status of the household units. The commands are transmitted to the plurality of interface units by the second transceiver. The interface units configure their corresponding household units in response to the commands.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a wireless network in accordance with the present invention;

FIG. 2 is a flow chart of the steps performed by a communication device, which forms a part of the network shown in FIG. 1;and

FIG. 3 is a flowchart of the steps performed by a network manager, which also forms a part of the network shown in FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG.1 shows a local area network 10 including a network manager 12 and a number of household units 14 such as appliances and consumer electronics. Each household unit 14 is equipped with a communication device 16 for communicating with the network manager 12 over the airwaves at radio frequencies. On a downlink frequency, the network manager 12 sends status and command frames to the household units 14. Periodically, the network manager 12 transmits status frames for the purpose of assessing the functional status of the household Kits 14. Occasionally, the network manager 12 transmits command frames for the purpose of programming a particular household unit 14. On an uplink frequency, the household units 14 transmit bursts to the network manager 12 in response to the status and command frames. The bursts indicate the functional status of the household units 14.

Each communication device 16 includes a first transceiver 18 and device driver 20. The first transceiver 18 receives a frame on the downlink frequency and supplies the received frame to the device driver 20. The first transceiver 18 can be a simple ASIC that has low input power, usually on the order of several milliwatts. The range varies, typically up to a few hundred feet. The device driver 20 is a programmable logic device that is adapted to accept data from the electronics of the household unit 14. Both the first transceiver 18 and the device driver 20 draw current from the household unit's power supply. Operation of the communication device 16 is described below in connection with FIG. 2.

The network manager 12 includes a personal computer 22 having a microprocessor 24, a storage device such as a hard disk drive 26, a display 28 and a keyboard 30. The network manager 12 also includes an expansion board 32. The expansion board 32 is electrically connected to the microprocessor 24 and includes a second transceiver 34 that communicates with all of the first transceivers 18 of the communication devices 16. The expansion board 32 also includes a device driver 36 that interfaces the second transceiver 34 with the microprocessor 24.

By way of example, the household units 14 include a television set, a VCR, a water heater, a thermostat for the air conditioner, a security system, and an oven. The network manager 12 transmits a status frame to check the functionality of the units 14. The frame is received simultaneously by the television set, VCR, water heater, thermostat, security system, and oven. The television set, oven and security system respond with bursts indicating whether they are turned on or off. The water heater and thermostat respond with bursts indicating the temperatures at which they are set. The VCR responds with a burst indicating the time and programs it is set to record.

The network manager 12, which stores the desired settings for the household units 14, compares the status contained in each burst to the desired setting. If the television is turned on, but the desired setting indicates that it should be turned off, the network manager 12 transmits a command frame to the television set, commanding it to turn off. If the temperature of the room is cooler than it should be, the network manager sends another frame commanding the thermostat to turn off

the air conditioner. If the VCR is programmed to record "The Simpsons", the network manager 12 sends yet another command frame commanding the VCR to turn off. FIG. 2 shows the steps performed by a communication device 16 for a household unit 14. The first transceiver 18 receives a frame (step 102), and the device driver 20 separates the frame into a header portion and a data portion (step 104). The header portion indicates which household unit 14 the frame is intended for. If the address in the header portion matches the address of the household unit 14 (step 106), the device driver 20 processes the data portion (step 108). If the data portion indicates that the frame is a status frame (step 110), the device driver 20 generates a burst indicating source and status (e.g., thermostat and room temperature setting) (step 112), and commands the first transceiver 18 to send the burst on the uplink frequency (step 114). If the data portion indicates that the frame is a command frame (step 110), the device driver 20 sets the household unit 14 to the setting stored in the data portion (step 116), generates a burst indicating the source and the new status of the household unit 14 (step 118) and commands the first transceiver 18 to send the burst on the uplink frequency (step 114).

FIG. 3 shows the steps performed by the network manager 12. The network manager 12 executes an application program stored on the hard disk drive 26. When the program begins, a menu is displayed on the display 28 (step 202). The menu specifies certain states, such as "AT HOME," "ASLEEP" and "ON VACATION." The menu also specifies the settings at the various states for the household units 14. Each state has its own default settings. The default settings can also be stored on the computer hard drive 26.

The user selects the state and reviews the settings that are displayed. If the user wishes to change the settings (step 204), an input is made via the keyboard 30. The new setting is received (step 206) and the settings on the menu are updated (step 202). Once satisfied with the settings, the user can either exit the program (steps 208 and 210) or allow the network manager 12 to control the household units 14. When the network manager 12 begins control, it sends a status frame to the household units 14 (step 212) and awaits the return bursts (step 216).

Once the bursts are received (step 218), each status therein is compared to a desired setting (step 220). For each household unit 14, if the status indicated in the burst matches the desired setting (step 222), the network manager 12 waits an interval and then sends the next status frame (step 224).

If the status indicated in a burst does not match the desired setting (step 222), the network manager 12 sends a command frame commanding the household unit 14 to change its setting (step 226). After the command frame is transmitted, the network manager 12 awaits a return burst indicating the new status of the unit 14 (step 228).

Returning to FIG. 1, if the computer is equipped with a modem 38, the network manager 12 can be connected to a wide area network. The wide area network provides access to other local area networks within a neighbourhood. It also provides a connection to the local police station. The network manager 12 can call the police station if the security system indicates an unauthorized entry through a window or door. Certainty of a break-in is increased if a household unit 14 does not respond to a status frame.

Thus disclosed is a network 10 for the control of household units 14. The household units 14 can be checked for status and they can be programmed remotely. Additionally, all of the units 14 in the household can be programmed conveniently from a single source. The network 10 can also function as a home security system, providing a high level of security and reliability.

It is understood that the embodiments described herein are merely exemplary and that many modifications and variations of the present invention are possible in light of the above teachings. For example, the network 10 can be used to control various units in an office complex as well as in a home. Therefore, the scope of the present invention is limited only by the appended claims.

Claims

1. A local area network (10) for a plurality of household units (14), comprising:

   a plurality of interface units (20) corresponding to the plurality of household units (14), each interface unit being electrically interfaced to a corresponding household unit;

   a plurality of first RF transceivers (18) corresponding to the plurality of interface units (20), each RF transceiver being in electrical communication with a corresponding interface unit;

   a second RF transceiver (34) operable to communicate with the plurality of first RF transceivers (18);

   and a processor (24) programmed to generate commands for controlling and checking the status of the household units, the commands being transmitted to the plurality of interface units by the second transceiver, the interface units configuring their corresponding household units in response to the commands.

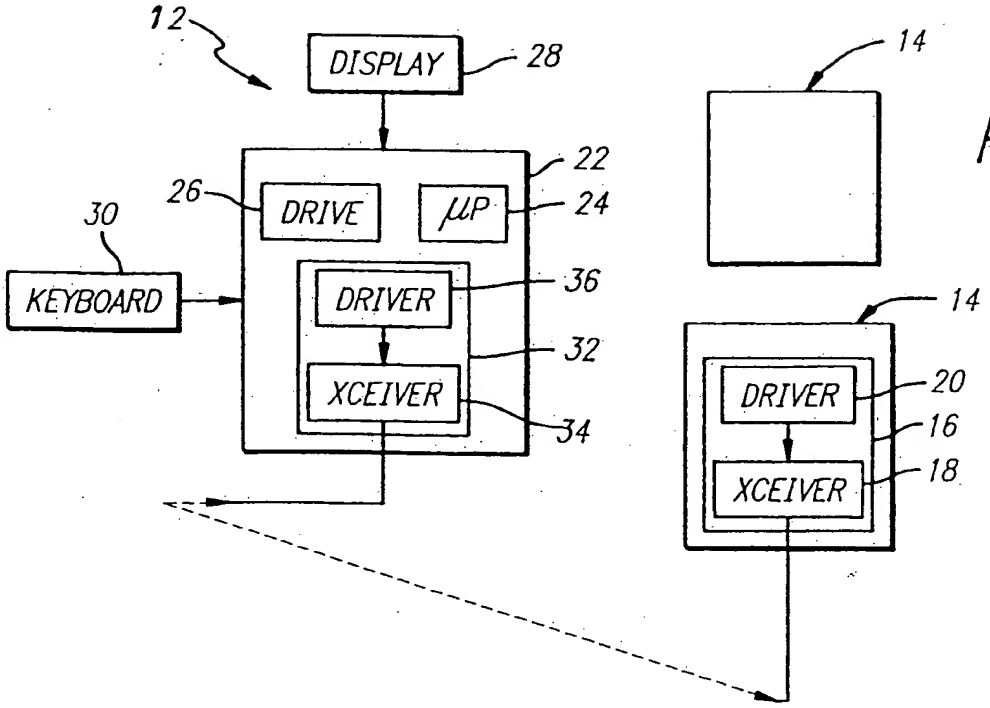
12
DISPLAY
28
14
22
26
DRIVE
μP
24
30
KEYBOARD
DRIVER
36
32
XCEIVER
34
14
DRIVER
20
16
XCEIVER
18

FIG. 1

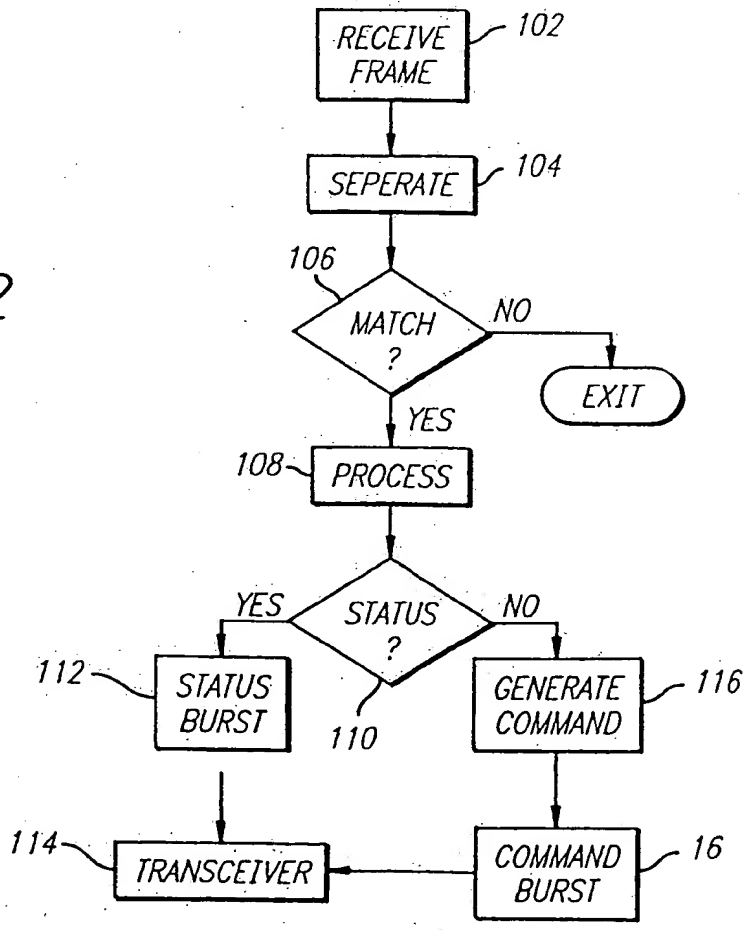
RECEIVE FRAME
102
SEPERATE
104
106
MATCH ?
NO
EXIT
YES
108
PROCESS
YES
STATUS ?
NO
112
STATUS BURST
110
GENERATE COMMAND
116
114
TRANSCEIVER
COMMAND BURST
16

FIG. 2

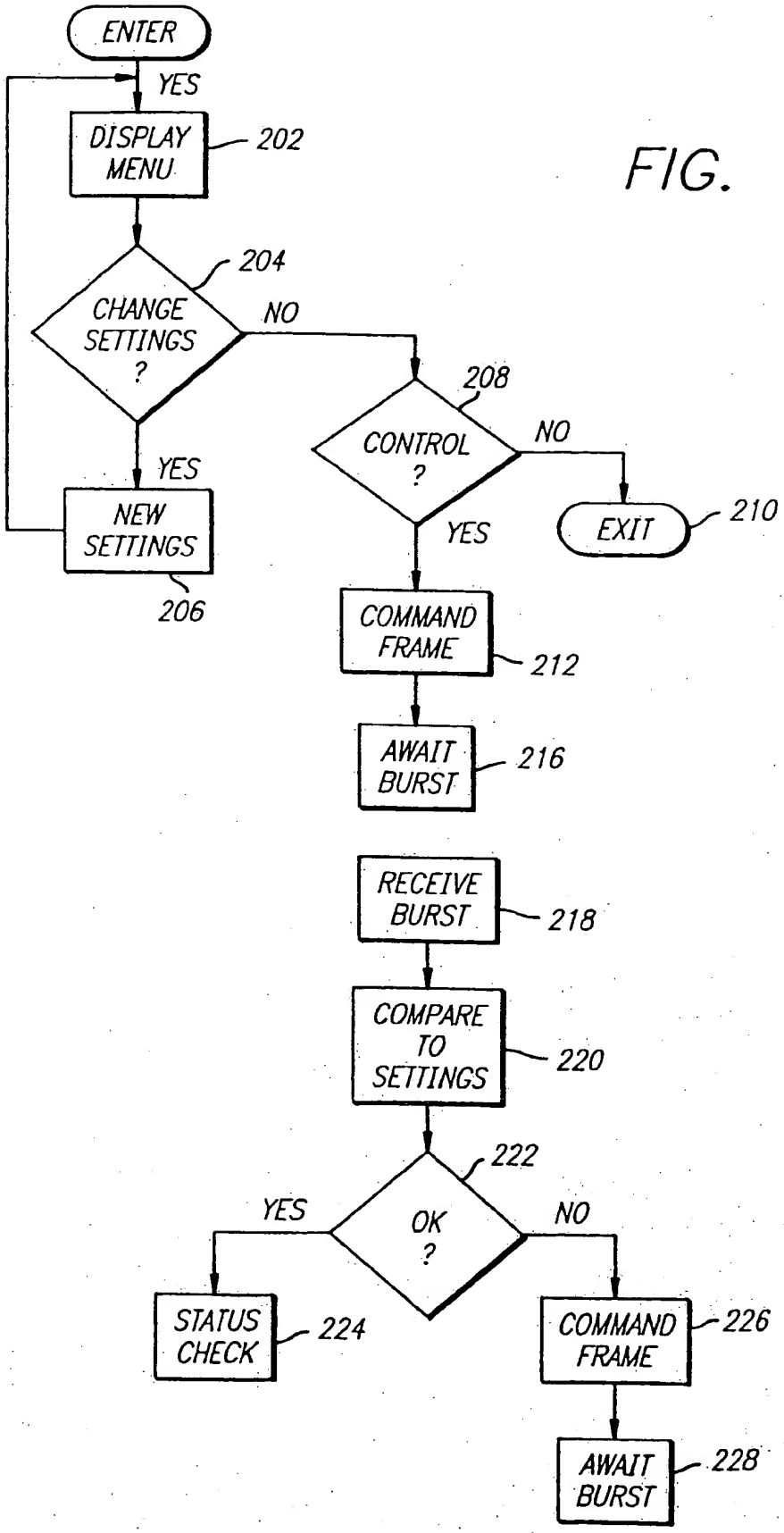
ENTER
YES
DISPLAY MENU
202
204
CHANGE SETTINGS ?
NO
208
CONTROL ?
NO
YES
NEW SETTINGS
206
EXIT
210
YES
COMMAND FRAME
212
AWAIT BURST
216
RECEIVE BURST
218
COMPARE TO SETTINGS
220
222
YES
OK ?
NO
STATUS CHECK
224
COMMAND FRAME
226
AWAIT BURST
228

FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 30 6741

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	MOTOROLA TECHNICAL DEVELOPMENTS, vol. 21, 1 February 1994, SCHAUMBURG,US, page 11 XP000438077 NAPOLITANO J: "WIRELESS EMERGENCY LIGHTING/PUBLIC ANNOUNCEMENT SYSTEM:" * the whole document * ---	1	G08C17/02
Y	GB-A-2 256 515 (NORM PACIFIC AUTOMATION CORP ;NORM PACIFIC AUTOMATION CORP (TW)) 9 December 1992 * page 1, line 1 - line 10 * * page 3, line 2 - page 4, line 7; figure 1 * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
G08C
H04L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 January 1997	Wanzeele, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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